ME-8953

Datum Inc.

Timing Instrumentation

ME-8953

INSTRUCTION MANUAL
MODEL 9100
COUNTDOWN CLOCK
PART NUMBER 9100-721

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ADDENDUM

In addition to the basic Countdown clock, the Model 9100-721 contains the following operational and/or output options:

1. The instrument's time base is the externally supplied 1PPS input. Refer to Paragraph 2.1.1 for specifications. The input connector is J1.

2. The display range is +/- 99 hours, 59 minutes, 59 seconds.

3. The HOLD pushbutton referred to throughout the text is labeled STOP in this configuration.

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NOTE:

Unless specified by the customer at the time of purchase, this instrument was shipped from the factory with connections made for operation from a 115 volts AC primary source. When instruments leave the factory wired for operation from a 220 volts AC source, the AC power connector is marked "220VAC". Refer to Pages iii, iv and v for instructions on re-configuring the power supply for operation from alternate primary power sources.

POWER SUPPLY ADJUSTMENTS

Voltage Taps (Refer to Figure A and Drawing 16494):

1. To provide compensation for line voltage and/or load variations, a HI/NORM/LOW tap is provided on Power Transformer, T1. This tap is set at the factory and should not normally require adjustment in the field. If, however, the AC line voltage is regularly 10% higher or lower than the nominal value, this tap may be moved as compensation for this condition. If the line voltage is 10% low, remove the soldered jumper from EP4 and re-install in EP3. If the line voltage is 10% high, re-install the jumper in EP5.

CAUTION

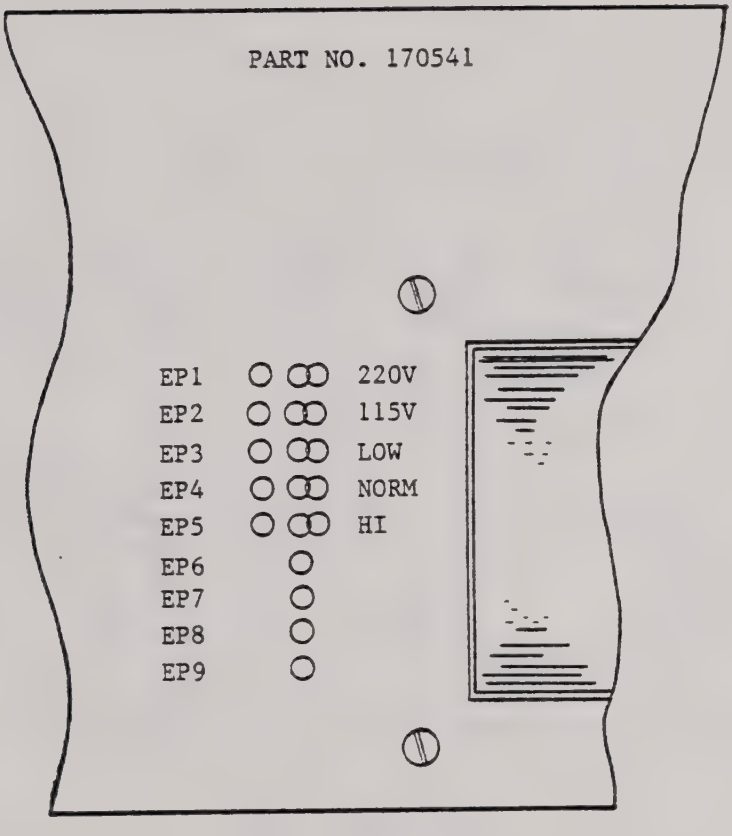
Only one tap should be installed in these positions. Otherwise damage to the power transformer will result.

NOTE

For certain instrument configurations, due to power supply load considerations, the instrument may be shipped from the factory with the voltage tap installed in one of the alternate positions.

2. For operation from a 220VAC nominal line, move the voltage select tap from EP2 to EP1.

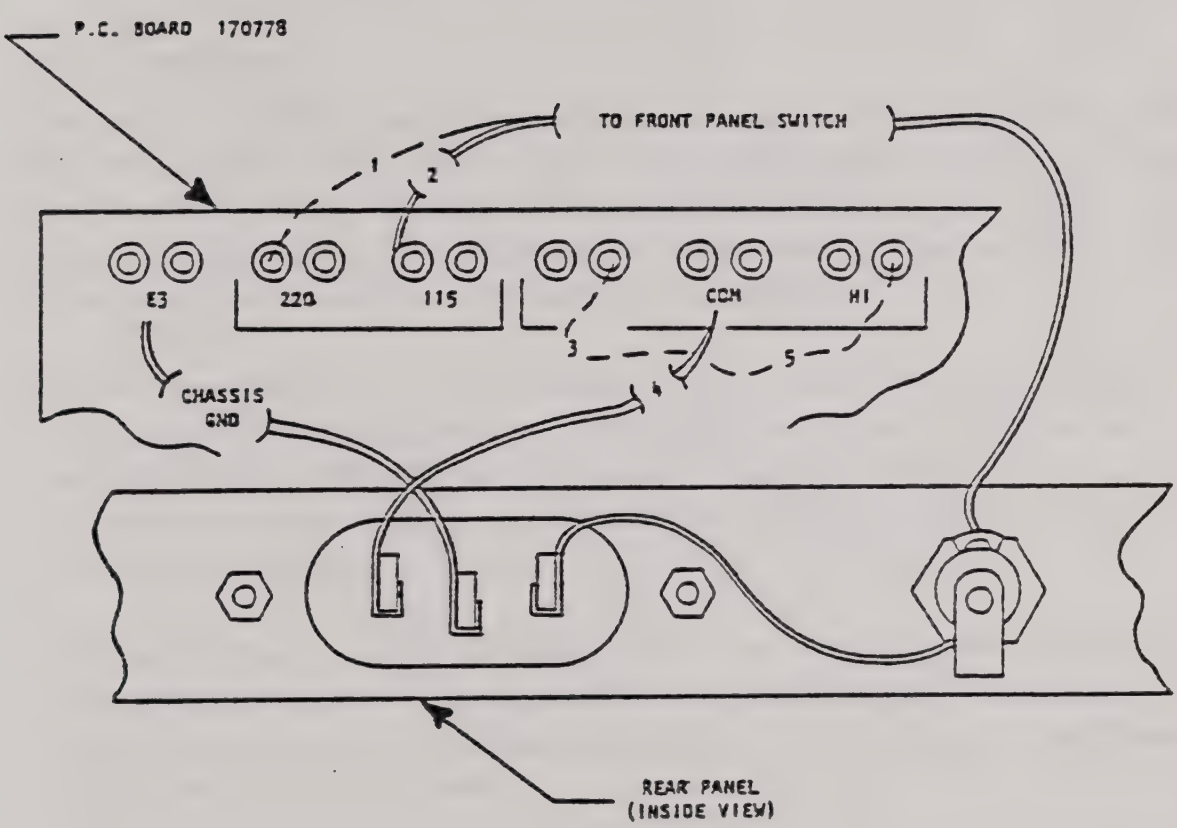
16494 POWER SUPPLY



NOTE

EP1 through EP9 are for reference only, and refer to transformer terminals 1 through 9 as shown on power supply logic print.

16280 POWER SUPPLY



1. Jumper #1 For 220 VAC Operation
2. Jumper #2 For 115 VAC Operation
3. Jumper #3 For Lo Line Voltage
4. Jumper #4 For Normal Line Voltage
5. Jumper #5 For Hi Line Voltage

SECTION I
SYSTEM DESCRIPTION

1.1 GENERAL

The DATUM 9100-700 Series Countdown Clock is designed to perform a time counting function in a bi-directional manner from a customer-selectable start time and to display this time via an easily readable seven-segment, light-emitting diode (L.E.D.) visual display. In addition, a variety of parallel and serial forms of countdown time may be optionally supplied to satisfy specific customer requirements.

The instrument may be preset to the desired start time via front panel controls or, optionally, via remotely supplied data. The range of the display is from zero up to 99 hours (999 Hours or 9 Days, 23 Hours are optionally available) 59 Minutes and 59 Seconds along with a direction sign ("+" or "-"). When the instrument is in the count hold condition, an "H" indicator is illuminated at the left end of the display.

Time counting may be started or stopped at any time via front panel controls or via remotely-supplied signals or switch closures. The instrument may be programmed via internal jumpers to either stop counting upon reaching a count of zero or to count down to zero and then start counting upward.

The instrument may be supplied with a variety of time bases, depending upon the needs of the customer. Standardly available are one of three 1MHz crystal-controlled oscillators, an externally-supplied 1KPPS clock or an externally-supplied 1PPS clock. When supplied with any but the 1PPS clock, a means is provided for synchronizing the instrument's 1PPS update with an externally-supplied 1PPS signal.

A red L.E.D. indicator (POWER FAILED) is provided to indicate that power has failed and that the displayed time may not be accurate. This indicator may be extinguished only by stopping the instrument and entering a new start time.

For a listing of the option(s) supplied with this particular instrument, refer to ADDENDUM page located immediately following the title page of this instruction manual.

SECTION II
SPECIFICATIONS

NOTE

Any deviation from or additions to these specifications will be listed on the Addendum page(s) located immediately following the Title Page of this instruction manual.

2.1 INPUTS

2.1.1 1PPS CLOCK (Input connector number is variable)

a.	Frequency:	One Hertz
b.	Input Levels:	Logical "0": +0.5 ±0.5VDC Logical "1": +4.25V ±0.75VDC
c.	"On-Time" Edge:	Positive or Negative-going (Jumper Selectable)
d.	Input Impedance:	5 Kilohms to +5 volts, 220 picofarads to ground

2.1.2 1KPPS CLOCK (Input connector number is variable) (Optional)

a.	Frequency:	One Kilohertz
b.	Input Levels:	Logical "0": +0.5V ±0.5VDC Logical "1": +4.25V ±0.75VDC
c.	"On-Time" Edge:	Positive or Negative-going (Jumper Selectable)
d.	Input Impedance:	5 Kilohms to +5 volts, 220 picofarads to ground

2.1.3 1PPS SYNC (Input connector number is variable) (Optional)

a.	Frequency:	One Hertz
b.	Input Levels:	Logical "0": +0.5V ±0.5VDC Logical "1": +4.25 ±0.75VDC
c.	"On-Time" Edge:	Positive or Negative-going (Jumper Selectable)
d.	Input Impedance:	5 Kilohms to +5 volts, 220 picofarads to ground

2.1.4 REMOTE RUN/HOLD, J3

a.	Pin 4:	Remote Hold
	Pin 5:	Remote Run
	Pin 6:	Signal Ground
b.	Input Levels:	Logical "0": +0.5V ±0.5VDC Logical "1": +4.25V ±0.75VDC
c.	Input Impedance:	5 Kilohms to +5 volts, .01 microfarads to ground, paralleling the front panel RUN/HOLD pushbutton switches
d.	Active Level:	Logical "0" or closure to ground performs indicated action.

2.1.5 PRESET INPUTS, J5 (Optional)

a. Twenty-six (26) lines (thirty (30) lines optional) representing preset time in seconds through 99 Hours (999 Hours is optionally available) in 8-4-2-1 Binary Coded Decimal (BCD) format plus direction sign (SET PLUS, SET MINUS) along with a remote enter line (SET) and the remote run and hold inputs.

b.	Input Levels:	Logical "0": +0.5V ±0.5VDC Logical "1": +4.25V ±0.75VDC
c.	Input Impedance:	Remote Enter: 5 Kilohms to +5 volts, .01 microfarads to ground. Data Line: High-speed C-MOS (HCMOS). Remote Run/Hold: 5 Kilohms to +5 volts, .01 microfarads to ground, paralleling the front panel RUN/HOLD pushbutton switches.

2.1.6 AC POWER, J6

a.	Input Voltage:	115 Volts, AC, Nominal or 220 Volts, AC, Nominal, ±10%
b.	Line Frequency:	48 - 420 Hz
c.	Input Power:	25 Watts, Nominal

2.2 OUTPUTS

2.2.1 C/D CODE OUTPUT (Output connector number is optional) (Optional)

a.	Format:	Per Figure 2-1 (99 Hours) Per Figure 2-2 (999 Hours)
b.	Carrier Frequency:	1 kHz
c.	Output Level:	Adjustable from 0-10 Volts, peak-to-peak ("mark" amplitude) into a load of 600 ohms to ground. Factory set at 3 v peak-to-peak.
d.	Modulation Ratio: ("Mark" to "Space")	Adjustable from 2:1 to 4:1 Factory set at 3:1

2.2.2 PARALLEL OUTPUTS, J4 (Optional)

a. Up to thirty-four (34) lines representing Countdown Time in milliseconds (optional), seconds, minutes and 99 Hours (999 Hours are optionally available) plus count status (HOLD), direction status (PLUS) along with an output strobe pulse (SAMPLE TIME) and remote Run/Hold inputs.

b.	Output levels:	Logical "0": +0.2V ±0.2VDC Logical "1": +3.7V ±1.3VDC
c.	Sample Time:	Normally a Logical "1", pulsing to a logical "0" for approximately 1.5 microseconds at the parallel outputs LSB update rate.
d.	Source Impedance:	Each output is capable of supplying up to ten (10) standard TTL loads.

2.3 INTERNAL TIME BASES (Optional)

a. Frequency: 1 MHz

b. Crystal Oscillator (Optional)

1) Temperature Stability: $< \pm 5 \times 10^{-6}$ from 0-50°C

2) Aging/Drift Rate: $< \pm 1 \times 10^{-7}$ /Day

c. Temperature-compensated Crystal Oscillator (Optional)

1) Temperature Stability: $< \pm 5 \times 10^{-7}$ from 0-50°C

2) Aging/Drift Rate: $< \pm 5 \times 10^{-8}$ /Day

d. Temperature-controlled Crystal Oscillator (Optional)

1) Temperature Stability: $< \pm 1 \times 10^{-8}$ from 0-50°C

2) Aging/Drift Rate: $< \pm 5 \times 10^{-9}$ /Day

2.4 ENVIRONMENT (Operating)

a. Temperature: 0-50°C

b. Humidity: Up to 95% relative, without condensation

2.5 PHYSICAL

a. Chassis Height: 1-3/4 inches

b. Chassis Width: 19 inches (including mounting flanges)

c. Chassis Depth: 12 inches (excluding handles)

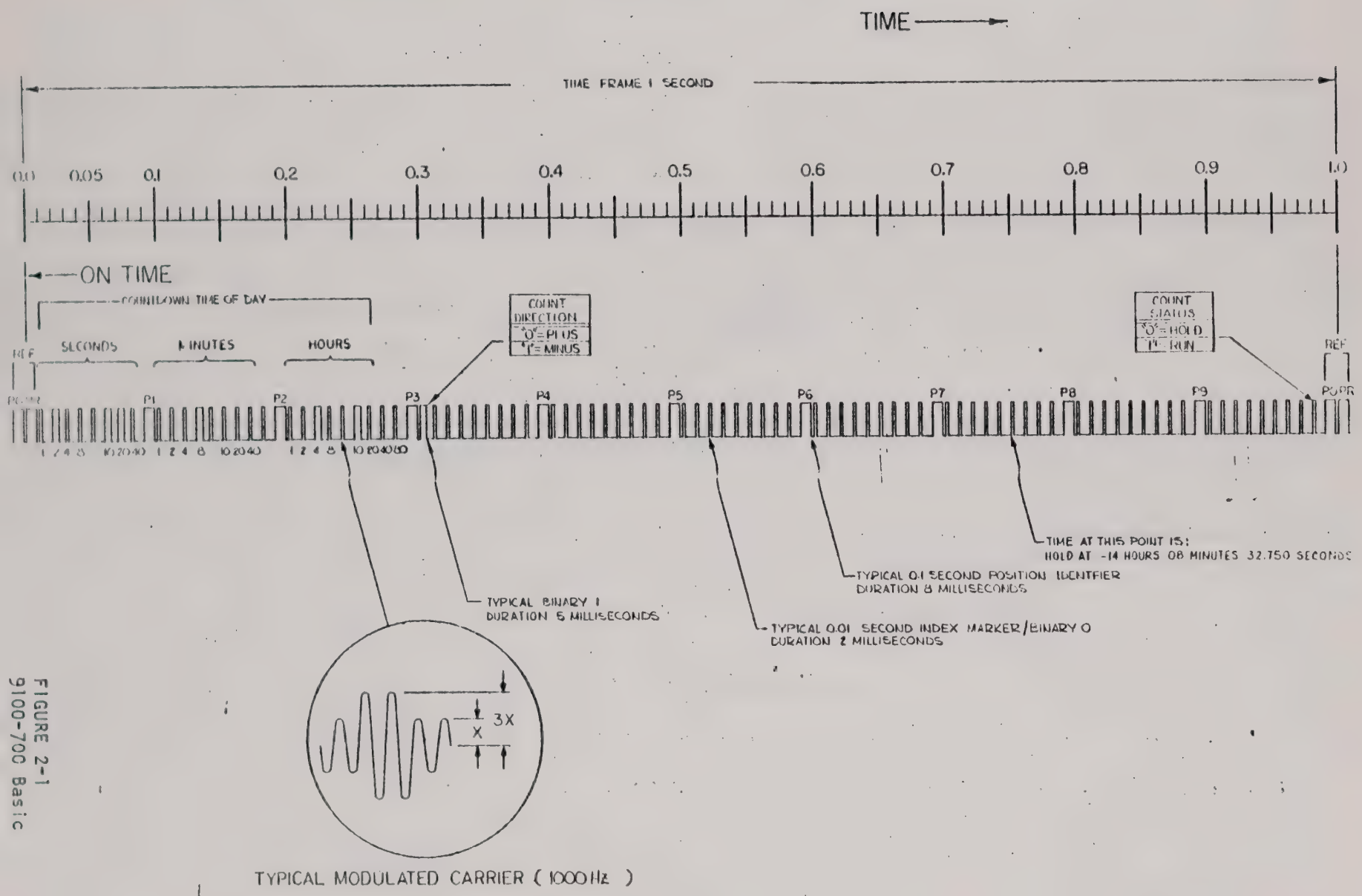


FIGURE 2-1
9100-700 Basic

DATUM COUNTDOWN CODE
PSEUDO BCD 8
CODE FORMAT : DATUM-TIED

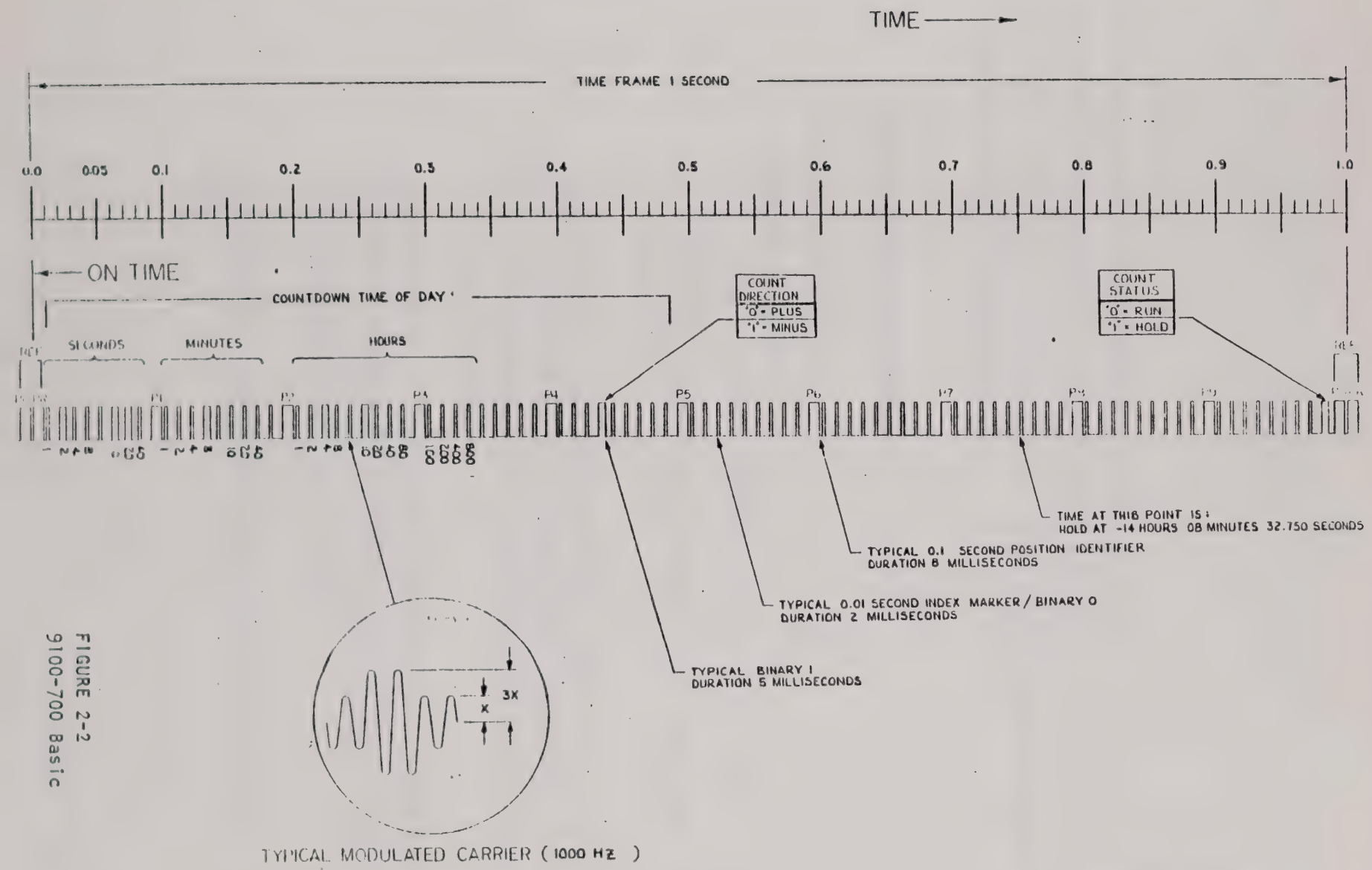


FIGURE 2-2
9100-700 Basic

DATUM COUNTDOWN CODE
PSEUDO IRIG B
CODE FORMAT : DATUM CD3

SECTION III
OPERATION

3.1 GENERAL

All controls and adjustments referenced in this section will be listed as marked on the instrument's front panel and/or on the appropriate drawings. Control names will be capitalized and underscored. Control positions, where appropriate, will be capitalized only. In the case of adjustment, the factory setting will be parenthetically indicated at the end of each control's descriptive paragraph.

3.2 CONTROLS AND ADJUSTMENTS

3.2.1 FRONT PANEL CONTROLS

a. POWER Toggle Switch
   1) In the ON position, applies primary operating power to the instrument.
   2) In the lower (off) position, removes primary power from the instrument.

b. HOLD Pushbutton - When activated, stops the clock's update at the 1PPS point. In instruments containing optional serial outputs and/or parallel outputs containing sub-seconds data, the serial output and sub-seconds data will continue to be available.

c. ENTER Pushbutton - When actuated, loads the contents of the PRESET thumbwheel switches into the instrument's time accumulator and display. This control is not functional when the instrument is updating. The ENTER switch extinguishes the Power Failed indicator.

d. RUN Pushbutton - When actuated, starts the clock's update at the 1PPS point.

e. PRESET SEC/MIN/HR Thumbwheel Switches - Used to select the time and directional data to be loaded into the instrument's time accumulator when presetting the clock. Data is transferred upon actuation of the ENTER pushbutton.

3.2.2 INTERNAL CONTROLS AND ADJUSTMENTS (Located on referenced assembly)

a. ZERO HOLD/CONTINUOUS Box-Pin Jumper (Assembly 19067) - Functional in the countdown mode of operation, this jumper is used to determine whether the instrument will count down to zero and automatically transfer to the "Hold" mode (ZERO HOLD) or will count down to zero and then begin counting upward (CONTINUOUS).

b. SYNC EDGE SELECT POS/NEG Box-Pin Jumper (Assembly 19067) - Used to select the "on time" edge of the 1PPS clock input when operating the instrument on the standard 1PPS time base or the "on time" edge of the 1PPS Sync input when operating from one of the optional (1KPPS/1MHz) time bases.

c. +5 Volts Potentiometer, R10 (Optional Power Supply Assembly 16280) - Used to set the output level of the +5 volts regulator, (+4.9V ±0.1V).

d. PHASE Potentiometer, R7 (Optional Countdown Encoder) - Used to adjust carrier phasing of the modulated countdown serial output so that modulation occurs on the zero axis crossing of the 1 kHz sine wave. Proper adjustment shows up as a lack of dis-continuity at the modulation points ("mark" to "space").

e. MODULATION RATIO Potentiometer, R15 (Optional Countdown Encoder) - Used to adjust the modulation ("mark" to "space") ratio of the modulated countdown serial output, (3:1).

f. LEVEL Potentiometer, R17 (Optional Countdown Encoder) - Used to set the output level of the modulated countdown serial output, (3V, P-P).

3.3 INDICATORS

3.3.1 POWER FAILED Red L.E.D. Indicator (decimal point beneath Ten Seconds display) - Used to indicate that operation of the clock has been interrupted by a failure of the instrument's power source. May only be reset by stopping the countdown clock, and entering a new start time.

3.3.2 Display - Used to indicate countdown time and sign ("+" or "-") via red seven-segment L.E.D.

3.4 OPERATION

3.4.1 Apply AC power to J6 (refer to Section II for Specifications). The indicators on the front panel will illuminate.

3.4.2 Connect the 1PPS Clock or optional 1PPS Sync to its input connector. Insure that the instrument is programmed for the proper "on time" edge of the 1PPS input (refer to paragraph 3.2.2 b).

3.4.3 Set the desired preset start time into the thumbwheel switches. Press HOLD or provide a closure to ground/logical "0" to the Remote Hold input. The instrument's display will be static. Press ENTER and note that the display now indicates "H" (HOLD) and the contents of the thumbwheel switches. Do not attempt to enter a time of -00:00:00.

3.4.4 Press the RUN pushbutton or provide a closure to ground/logical "0" to the Remote Run input. Note that the "H" indicator is extinguished and that display is updating at a 1PPS rate. The instrument will count to +99/+999 Hours, 59 Minutes, and 59 Seconds, radix to zero and continue counting in the plus direction. If the start time was a minus number, the instrument will count down from the minus number to -01 Second, update to +00 Seconds and begin counting upward. If the instrument is programmed for "Zero Hold" operation, the instrument will count from -00/000:00:01 to +00/+000:00:00 and automatically go to "Hold", illuminating the "H" indicator.

3.4.5 Associated with the internal logic is a "power-failed" indicator on the front panel. This indicator will illuminate whenever power to the unit has been interrupted (and then restored) indicating that the displayed time may no longer be valid. Pressing HOLD then ENTER extinguishes the indicator.

3.4.6 To stop the count at any time, press the HOLD pushbutton or provide a closure to ground/logical "0" to the Remote Hold input.

3.5 REMOTE PRESET

Referring to the Pin Assignments and Specifications in Section II, set up all Remote Preset lines to the desired preset time. Provide a momentary closure to ground/logical "0" to the Remote Hold input. The instrument will stop updating. Provide a momentary closure to ground/logical "0" to the SET input. The display will update to its new value. At the desired start time, provide a momentary closure to ground/logical "0" to the Remote Run input. The instrument will commence incrementing or decrementing at a 1PPS rate.

SECTION IV
MAINTENANCE

4.1 GENERAL

This instrument's logic is comprised of integrated circuits. There are no moving parts or parts with limited life. There is no periodic maintenance required for the unit under normal conditions. If the unit is exposed to unusual operating conditions such as high dust or high humidity environments, or if the unit is dropped or otherwise damaged, it may be necessary to perform certain inspections and/or repairs.

If it is necessary to inspect the unit, the following should be considered:

1. Always disconnect AC power before removing the instrument's top or bottom cover. To remove the cover, simply remove the screw at the rear panel and slide the cover off the rear.

2. Make a thorough visual inspection of all circuitry and wiring.

3. Check for physical integrity of all components. Look for burned or cracked components, loose physical damage, leakage of insulation compounds or general physical damage. To aid in overall maintenance and repair, each integrated circuit is mounted in an individual modular socket. Removal or replacement is therefore convenient and easy.

   It should rarely be necessary to replace an integrated circuit; however, if replacement is attempted, be sure that all component leads enter the socket and that no leads are bent under the component or extended out from the socket.

   Check to see that all IC's are firmly mounted in the socket so that good electrical contact is made.

4. Check all switches and connectors for loose or broken wires.

5. If the internal component surfaces and components have an excessive amount of dust deposited on them, use a soft brush and a low pressure stream of air to remove any foreign material.

CAUTION

Do not clean PC boards or small internal components with a stiff brush or solvents since damage to the circuits may result. A high-powered vacuum cleaner device should not be used on small internal components.

6. Wipe the external surfaces of the instrument with a soft, damp cloth to remove dirt, fingerprints and other foreign material.

7. Replace the cover(s) and reconnect the AC power and input connector. Check operation. If performance does not match or exceed the specifications listed, corrective maintenance is in order.

Printed Circuit Board Repair

Removal and insertion of IC components can be easily made as described above. Should it be necessary to replace conventional components which are soldered to the circuit board, cut the leads of the part near the lead holes. Using a low power (50 watts or less) soldering iron, apply heat sparingly to each cut lead. As soon as the solder melts, slip the lead from the hole and clean the hole with a toothpick. Clean the board surfaces with isopropyl alcohol. Form the tinned leads of the replacement part and insert in cleaned holes, trimming the leads to extend 1/16 inch beyond the back surface of the board. Only 63/37 solder with a maximum diameter of 1/16 inch should be used. Solder the leads to the board and use a hemostat, long-nosed pliers, or other heat sink on the leads of all semi-conductor devices and quarter-watt resistors. Allow the soldered junction to cool before removing the heat sink.

WARNING

Potentially lethal voltages are present in the instrument. Use caution at all times when the protective covers are removed.

SECTION V
THEORY OF OPERATION

5.1 GENERAL

The DATUM Model 9100-700 Series Countdown Clock is comprised of several printed circuit cards interconnected via wire-wrapped connections. A mechanical view of the instrument is provided via the Top Assembly Drawing. This drawing may be used for general mechanical dimensions, input/output connector referencing and for circuit card location.

5.2 TERM REFERENCING TECHNIQUE

The basic instrument is comprised of three circuit cards, consisting of the Countdown Clock, Display and Power Supply assemblies. The schematic diagrams which depict these circuit cards utilize a system of circled numbers as an aid in following the various logic terms back and forth through the drawings. Contained with the title block of each page of the drawings is a circled number. This circled number is known as the Term Reference Number (depicted in this text as a number in parenthesis), and is used to indicate the source page of each logic term. The drawings are arranged in Term Reference Number sequence. A logic term which originates on any page other than the page being studied is preceded either by a Term Reference Number or a parenthesis grouping together a set of logic terms preceded by a single Term Reference Number. The drawing page which contains this Term Reference Number in its title block is the page on which the point of origin of the logic term in question is depicted.

5.3 CIRCUIT CARD LOCATION

In the lower left hand corner of the first sheet of the Top Assembly Drawing is a list of each circuit card contained within the instrument. Each assembly is identified both by its title and assembly number as contained within the title block of the associated schematic. Preceding each assembly number is a circled code letter ((A), (B), etc.).

To determine the physical location of a particular circuit card assembly, determine the code letter for the desired assembly. Observe the mechanical view of the instrument on

the second sheet of the Top Assembly Drawing to locate the circuit card which is identified with the appropriate code letter.

5.4 THEORY OF OPERATION

5.4.1 GENERAL

The Countdown Clock's standard time base is remotely-supplied 1PPS pulse is routed to a string of up/down decade dividers and count permuting circuitry referred to as the Major Time Counter. This divider string counts 1PPS clocks and permutes this count into a set of 8-4-2-1 binary coded decimal (BCD) terms which represent elapsed time in seconds, minutes and hours. The outputs of the Major Time Counter are routed to a set of BCD to seven-segment decoders which, in turn, supply inputs to the display for visual interface to the user.

In instruments which are supplied with one of the optional 1KPPS or 1MHz time bases, this time base is routed to a string of decade dividers referred to as the Minor Time Counter. The Minor Time Counter divides the optional time base down to 1PPS and produces a set of intermediate BCD outputs. The 1PPS output of the Minor Time Counter is used to update the Major Time Counter.

Outputs from the Major and Minor Time Counters are routed to a variety of optional serial and/or parallel output circuits to provide outputs in accordance with individual customer's requirements.

The detailed circuit description which follows will be discussed in Term Reference Number sequence. Before proceeding, the reader should be familiar with paragraphs 5.1 and 5.2, which describe DATUM's general documentation and logic referencing system.

5.4.2 CIRCUIT DESCRIPTION

(7) COUNTDOWN CLOCK (Time Base/Miscellaneous Circuits)

This drawing depicts two of the three standardly available optional 1MHz crystal-controlled oscillators. Refer to Section II, SPECIFICATIONS for characteristics of the two time bases.

One-shot multivibrator SYNC and its input gating is used to synchronize the optional Minor Time Counter to an externally-supplied 1PPS TTL pulse. Provisions are made to allow for synchronization on either the positive or negative-going edge of the 1PPS input.

The POWER FAILED circuit consists of a red light-emitting diode (L.E.D.) driven by an R-S latch-controlled transistor, which alerts the user that a power interruption has occurred. When power is applied, or returns after an interruption, the R-S latch is set by the R-C delay in turning on transistor Q1. The logic term PF-I (Power Failed Indicator) is routed to the cathode of the indicator. The R-S latch is reset by entering new time data. This requires placing the instrument into HOLD mode and bringing the ENTER line to a logical "0", either by the front panel switches, or through the optional remote lines.

Also illustrated on this drawing are the inverters used for the optional 1KPPS time base and the jumper for selecting either the Zero Hold or Continuous count mode (see (8)).

(8) COUNTDOWN CLOCK (Minor Time & Control)

This circuit consists of six cascaded decade dividers which divide the 1MHz time base (MCC) to produce a 1PPS output (tSC8) along with a set of intermediate BCD scan terms. The Minor Time Counter is controlled by an R-S latch (RUN/HOLD) which determines the operating mode of the instrument.

The RUN/HOLD latch is set to the HOLD condition by either the HOLD pushbutton or by an externally supplied Remote Hold ($\overline{RH}$) command. The latch is reset to the RUN condition by either the RUN pushbutton or by an externally supplied Remote Run ($\overline{RR}$) command.

The falling edge of the clock (normally tSC8) triggers one-shot multivibrator CLK. The output of this one-shot is gated with the RUN/HOLD latch and with the count direction control lines (PLUS/MINUS) to produce up/down clocks for use by the Unit Seconds counter in the Major Time Counter.

Also illustrated on this drawing is one-shot multivibrator INH which determines the Zero Hold or Continuous Counting mode of operation. When enabled by the ZERO HOLD/CONTINUOUS jumper on (7), INH will be clocked by the borrow output of the most significant decade of the Major Time Counter (9). This will automatically set the

RUN/HOLD latch to the HOLD condition when the Major Time Counter reaches zero. Initiating a Run command will allow the clock to resume counting.

It should be noted that setting the RUN/HOLD latch to the HOLD condition does NOT inhibit updating of the Minor Time Counter. This allows optional serial outputs to continue, with Major Time data being held static.

(9) COUNTDOWN CLOCK (Major Time)

This circuit consists of a series of cascaded up/down decade dividers and associated count permutation and control logic to permute the 1PPS clock from the Minor Time Counter into a BCD format representing accumulated countdown time in seconds, minutes and hours.

The decade dividers may be preset to the desired count by addressing the four data input pins (15, 1, 10, 9) and applying a logical "0" to the $\overline{\text{PRESET}}$ pin (11). Presetting is accomplished via the strobe term $\overline{\text{ENTER}}$ which is derived from the ENTER pushbutton.

The decade divider/counters are internally permuted to a divide-by-ten configuration. Those counters which are required to divide by some number other than ten (i.e., the Ten Seconds, Ten Minutes, and Hours counters) are permuted via one-shot multivibrators (TSR, TMR) which are clocked with a decoded count of six. When the instrument is counting up (PLUS = 1), the output of these reset one-shots is routed to the reset pin (14) of the associated counter(s), foreshortening the count and simultaneously updating the successive decade.

When the instrument is counting (RUN = 1, HOLD = 0), the data input pins of the Ten Second and Ten Minute counters are programmed to a BCD "5". When counting down (MINUS = 1) the above mentioned reset one-shots are triggered on the next clock after the associated counter reaches zero. The one-shot output is routed to the $\overline{\text{PRESET}}$ pin (1) of the associated counter(s), setting the counter to its permuted maximum count.

Count direction is controlled by the PLUS/MINUS R-S latch. When the instrument is stopped, this latch can be set to either state by the preset logic. When operating in the countdown mode, the trailing edge of the clock which causes all counters to be zero "walks through" the entire string to produce a "borrow" clock at the output of the most significant decade counter. The "borrow" resets the PLUS/MINUS latch and

simultaneously triggers one-shot multivibrator NR which holds all counters reset while the direction latch changes state, preventing an erroneous "up" clock while the up/down clock lines are changing states.

(10) COUNTDOWN DISPLAY

This logic converts the four-line BCD outputs of the Major Time Counter into a seven-line format which drives the seven-segment L.E.D. indicators to provide a visual display of the countdown time status.

(11) SWITCH & CONTROL LOGIC

This drawing illustrates the interface of the front and rear panel controls, connectors and other logic elements to the various circuit card assemblies within the instrument and interfaces between the several circuit card assemblies. Any logic elements which are not physically a part of one of the circuit card assemblies are shown on this drawing. Any logic terms referenced to this drawing and not shown here are not used in this particular configuration.

(30) PARALLEL OUTPUTS (Optional)

This logic consists of a set of non-inverting TTL buffers used to provide isolated outputs of the Minor and/or Major Time Counter(s) for distribution as required by the user.

(49) POWER SUPPLY (Assembly 16494)

This Power Supply furnishes regulated +5 volts, DC, operating voltage to the instrument. The +5 volts regulators are integrated circuit type regulators with internal fault protection.

(49) POWER SUPPLY (Assembly 16280, Optional)

This Power Supply furnishes regulated ±15V DC and +5V DC to the instrument. The ±15V DC regulators are integrated circuit regulators with internal fault protection. The +5V DC regulator employs LM305 voltage regulator and is of the switching type.

The LM305 is essentially an operational amplifier with a built-in Zener reference. When the voltage on A1, pin 6 falls a few millivolts below that of the internal reference, Q1 and Q2 are turned on and the voltage on the output line begins to rise. Q1 and Q2 turn off as

the voltage on pin 6 rises above the reference level. L1 tries to maintain constant current flow and current begins to flow through CR2. This continues until Q1 and Q2 are again turned on and the cycle is repeated.

The switching regulator is thus an efficient method of obtaining constant 5V DC from an unregulated source since power is dissipated in Q1 only when it is on or changing states. For 5 volts from a 23V source, Q1 is on approximately 25 percent of the time.

Q3 and Q4 provide short circuit protection by forcing the regulator to decrease the output voltage when the current through R7 becomes excessive. When the output voltage becomes too high, CR5 conducts and CR6 is turned on. The current limit circuit then shuts down the regulator. After the regulator has been shut down by either the overvoltage or overcurrent circuits, it will be necessary to remove power and allow the unregulated voltage to decay to a value of less than approximately two (2) volts before attempting to re-start the regulator.

(50) (51) COUNTDOWN ENCODER (Optional)

This logic utilizes scan terms from the Minor Time Counter and the outputs of the Major Time Counter to produce one of the two serial Countdown Code formats illustrated in Figures 5-1 and 5-2.

Major Time Counter outputs are supplied as inputs to a series of Data Selector/Multiplexers. These multiplexers are scanned in parallel by terms from the Minor Time Counter to provide five serialized "sub-words" X0 through X4. These "sub-words" are routed to the inputs of another Data Selector/Multiplexer. This second-level multiplexer is scanned to provide a serial "word" containing the five "sub-words" in the appropriate order illustrated in the format drawing.

Although the data at this point is serial, it does not conform to the pulse-width aspect of the code format. Flip-flop DCSC is clocked "true" at the 100PPS element rate of the countdown format. A gating structure controls the time at which DCSC is allowed to clock "false", in accordance with the code format. This occurs after two milliseconds (Binary "0"), five milliseconds (Binary "1") or eight milliseconds (Position Identifier or Frame Reference). DCSC then represents the DC envelope of the Countdown Code format.

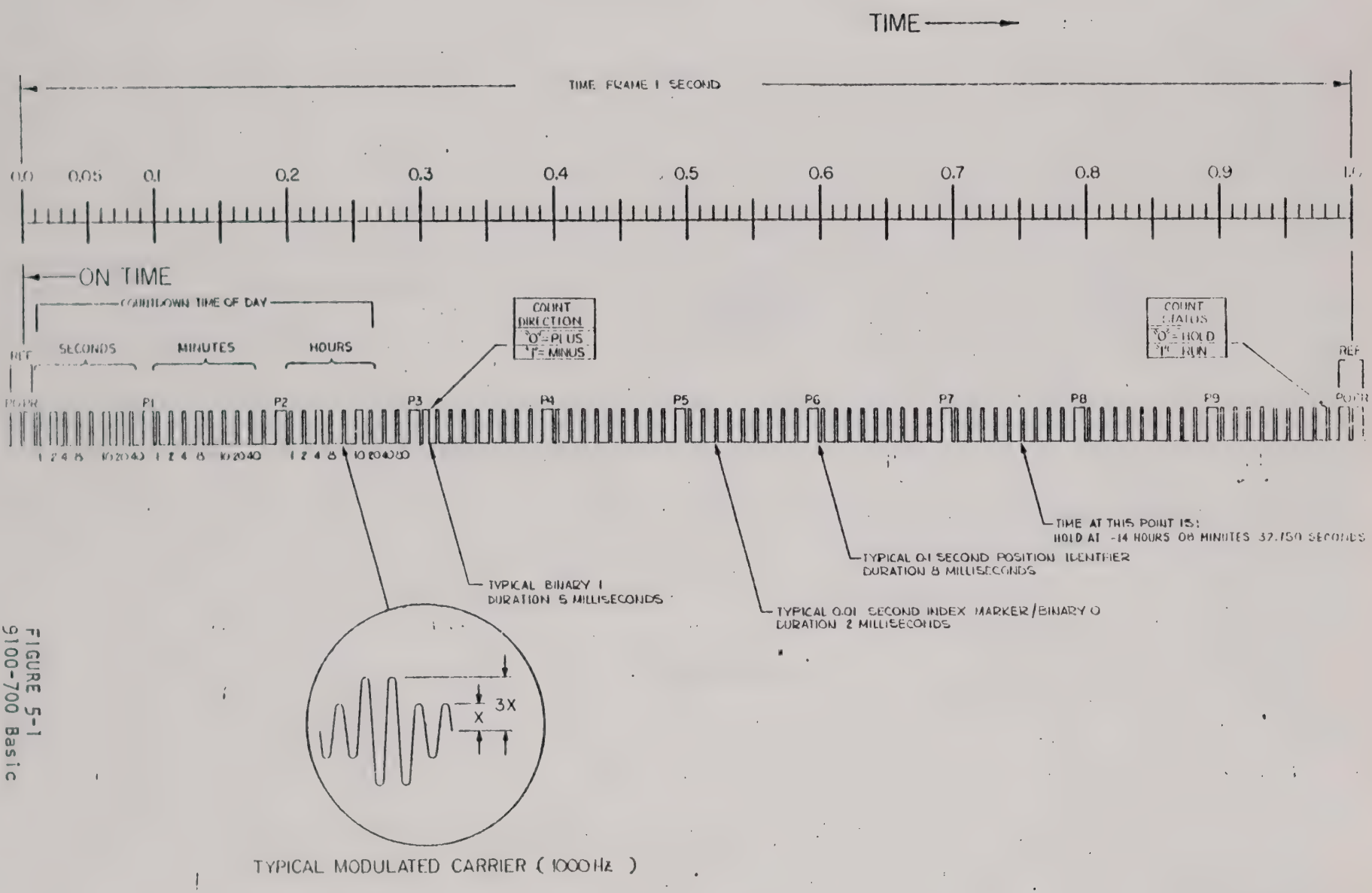


FIGURE 5-1
9100-700 Basic

DATUM COUNTDOWN CODE
RESOLVER BASIC
CODE FORMAT: DATUM 9100

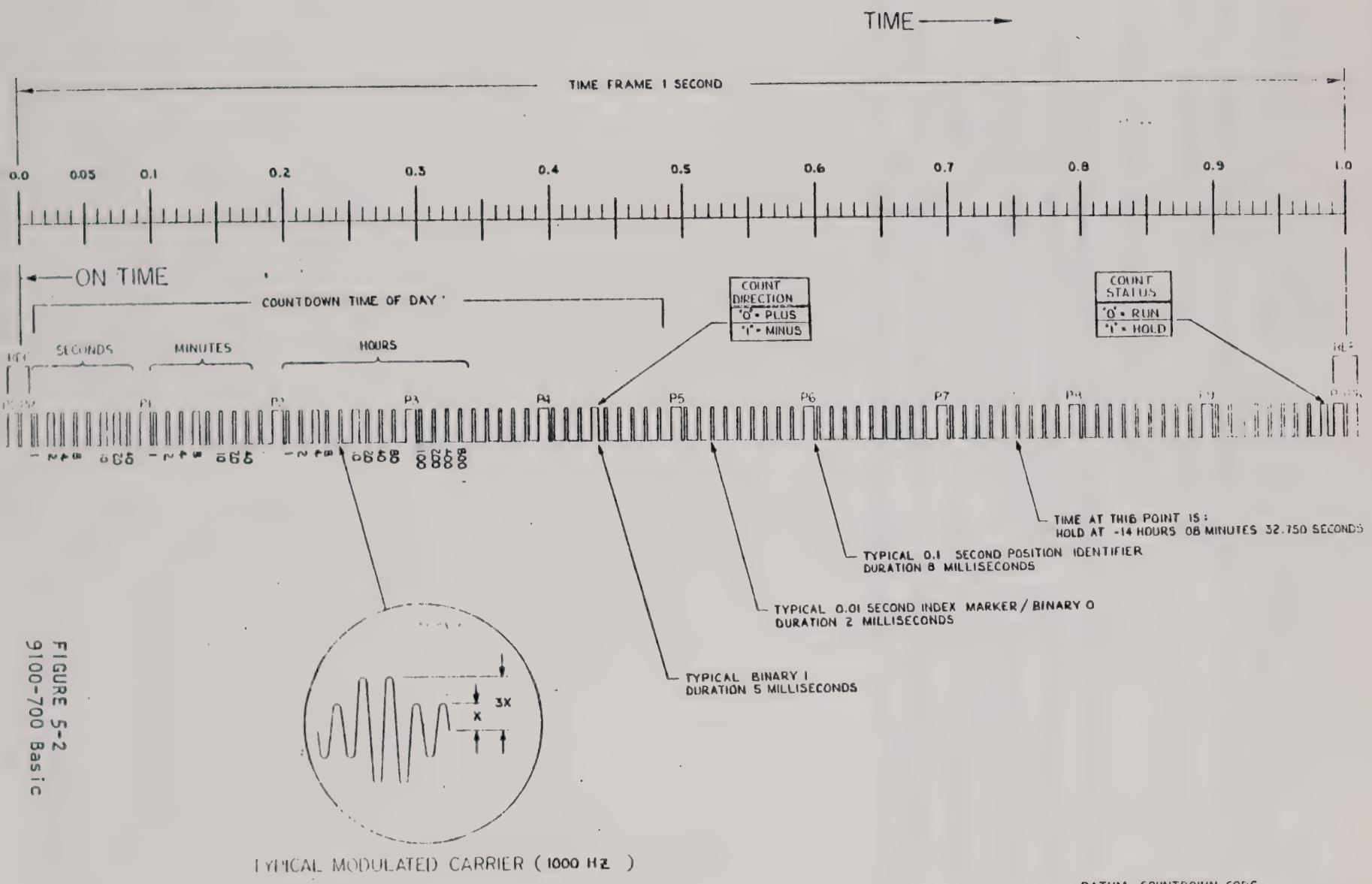


FIGURE 5-2
9100-700 Basic

DATUM COUNTDOWN CODE
PSEUDO IRIG B
CODE FORMAT : DATUM C03

Scan terms from the Minor Time Counter are gated together to produce a 1KPPS squarewave at TP2. This squarewave is AC coupled to a filter network which produces a 1KHz sinewave at TP3. This sinewave is amplitude modulated by the DC envelope DCSC from (50) to produce the modulated serial output at TP4.

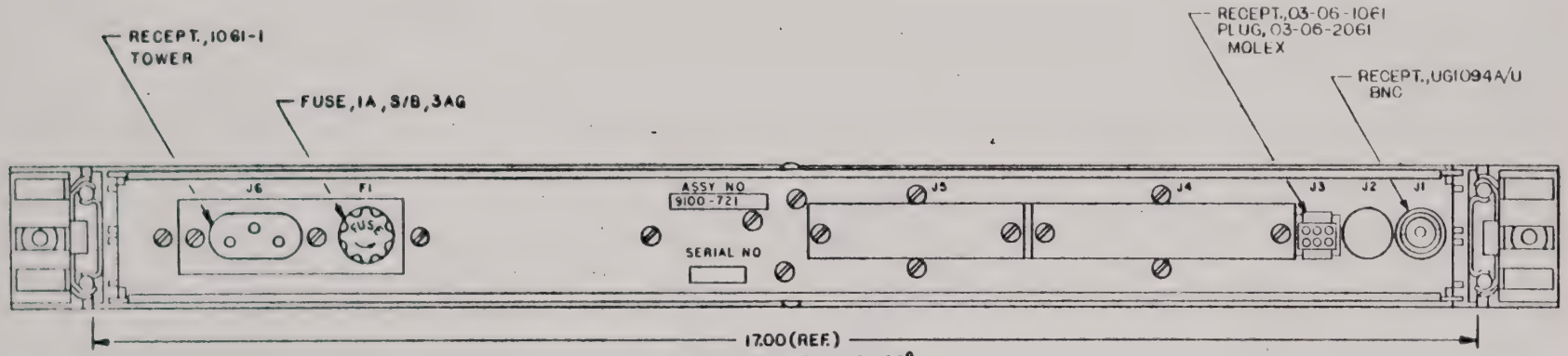
(60) (61) PRESET CONTROL LOGIC (Optional)

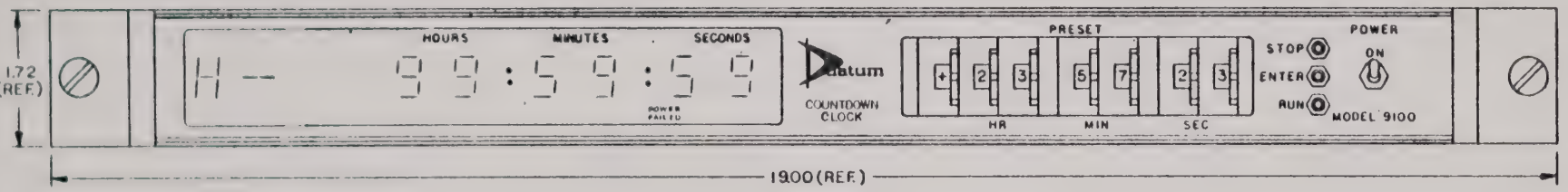
This logic is used to select either front panel controls or remotely supplied data to be used to preset the Countdown Clock to the desired start time. Data from front panel controls and from the rear panel is routed to a set of quad two-way data selectors. Normally, these data selectors route the front panel data to the Major Time Counter. The Remote Set input $\overline{\text{SET}}$ is used to trigger one-shot multivibrator REM which simultaneously triggers one-shot LD. REM temporarily selects the remotely-supplied data while LD, which is "OR'ed" with the ENTER pushbutton, provides the load command to the Major Time Counter.

SECTION VI
DRAWINGS

1.	Countdown Clock (Top Assembly)	9100-721
2.	Countdown Clock (Logic) (7) (8) (9)	19067
3.	Countdown Display (10)	19066
4.	Interface Drawing (11)	9100-8445
5.	Power Supply (49)	16494

LTR	DESCRIPTION	DATE	APPROVED
A	REVISED PER ECO T4312	7 23 81	[illegible]
B	REVISED PER ECO T4465	[illegible]	[illegible]





5. SWITCH AND CONTROL LOGIC 9100-8445
4. WIRELIST 804058

J6-AC POWER INPUT
J5-
J4-
J3-EXTERNAL RUN/HOLD INPUT
J2-

3. J1-1PPS SYNC INPUT
2. SLIDES AND MOUNTING BRACKETS ARE OPTIONAL

(M)	16494	POWER SUPPLY
(B)	19067	COUNTDOWN CLOCK
1 (A)	[illegible]	DISPLAY

NOTES: UNLESS OTHERWISE SPECIFIED

THIS DATA IS CONFIDENTIAL TO DATUM, INC AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT

TITLE: COUNTDOWN CLOCK

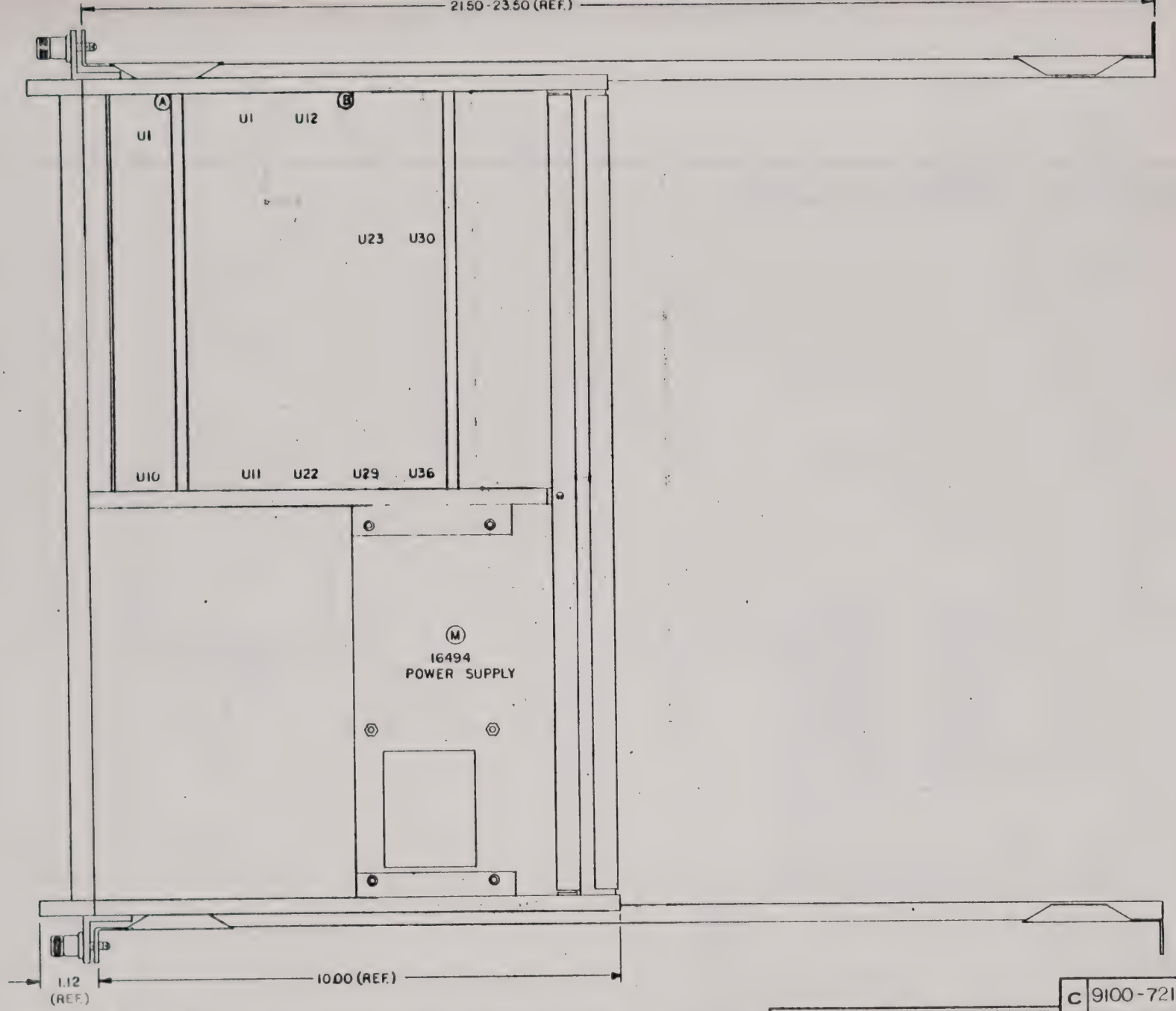
DWN TERI 12/5/81 | CHK | ENGR | MFG

SCALE NONE | FSC 31160

Datum inc.
1363 S. STATE COLLEGE BLVD
ANAHEIM CALIFORNIA 92806

C | 9100-721 | E

DATE | SHT 1 OF 2 | REV



NOTE: TOP COVER REMOVED FOR CLARITY

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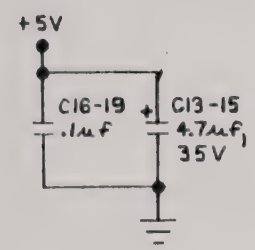
C	9100-721	B
SIZE	SHT 2 OF 2	REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



DEVICE TYPE	REF. DES.
MM74C00	U9,25,27
MM74C08	U10,15,18
MM74C221	U14,19
MM74HC14	U17,28
MM74HC32	U8,16
MM74HC192	U5,6,7,11,12,22
MC14023BCP	U26
MC14073BCP	U24
MC74HC4538	U21,23

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: XXX ± .005 ANGLES ± 1/2°

TITLE: COUNTDOWN CLOCK

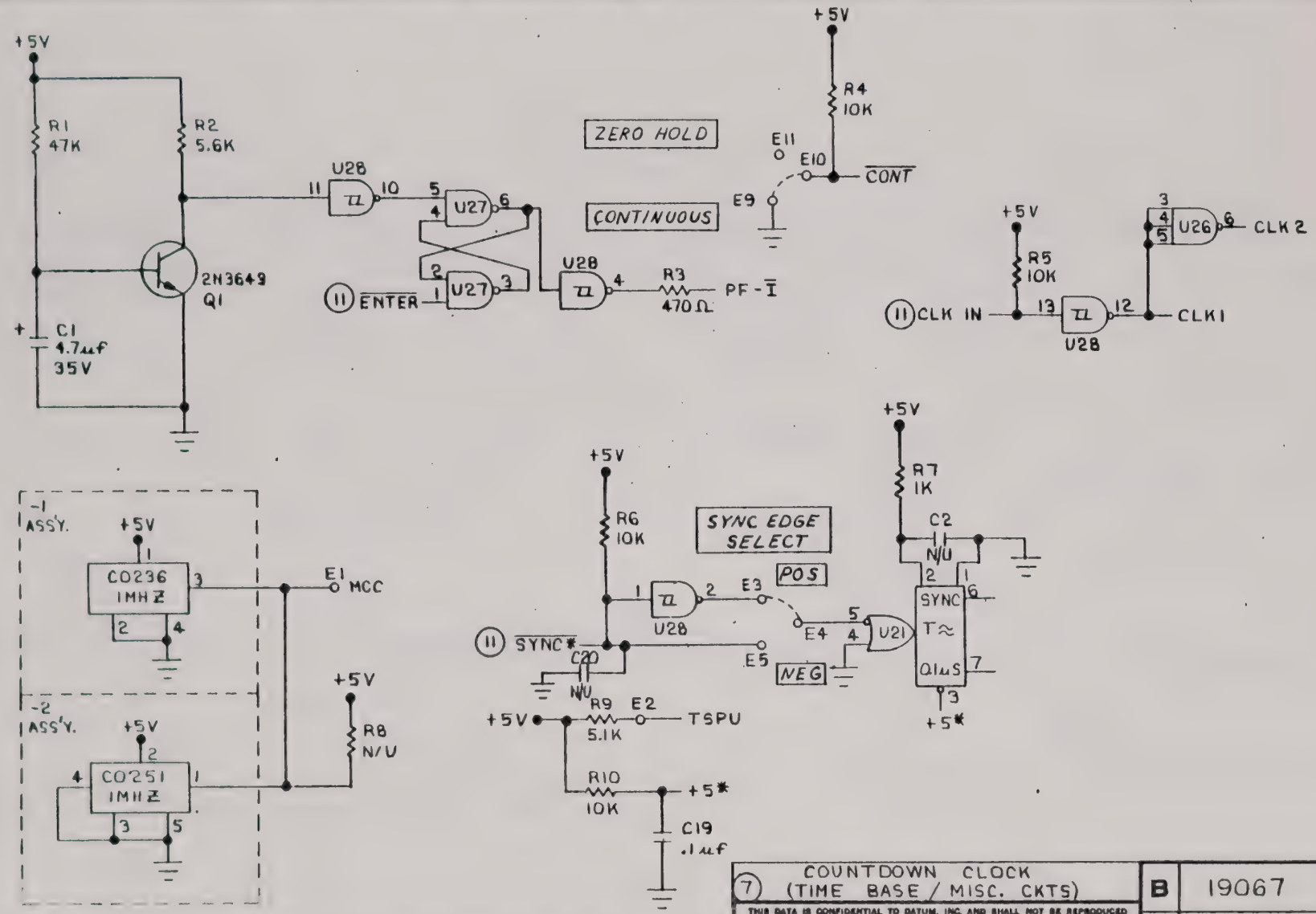
Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

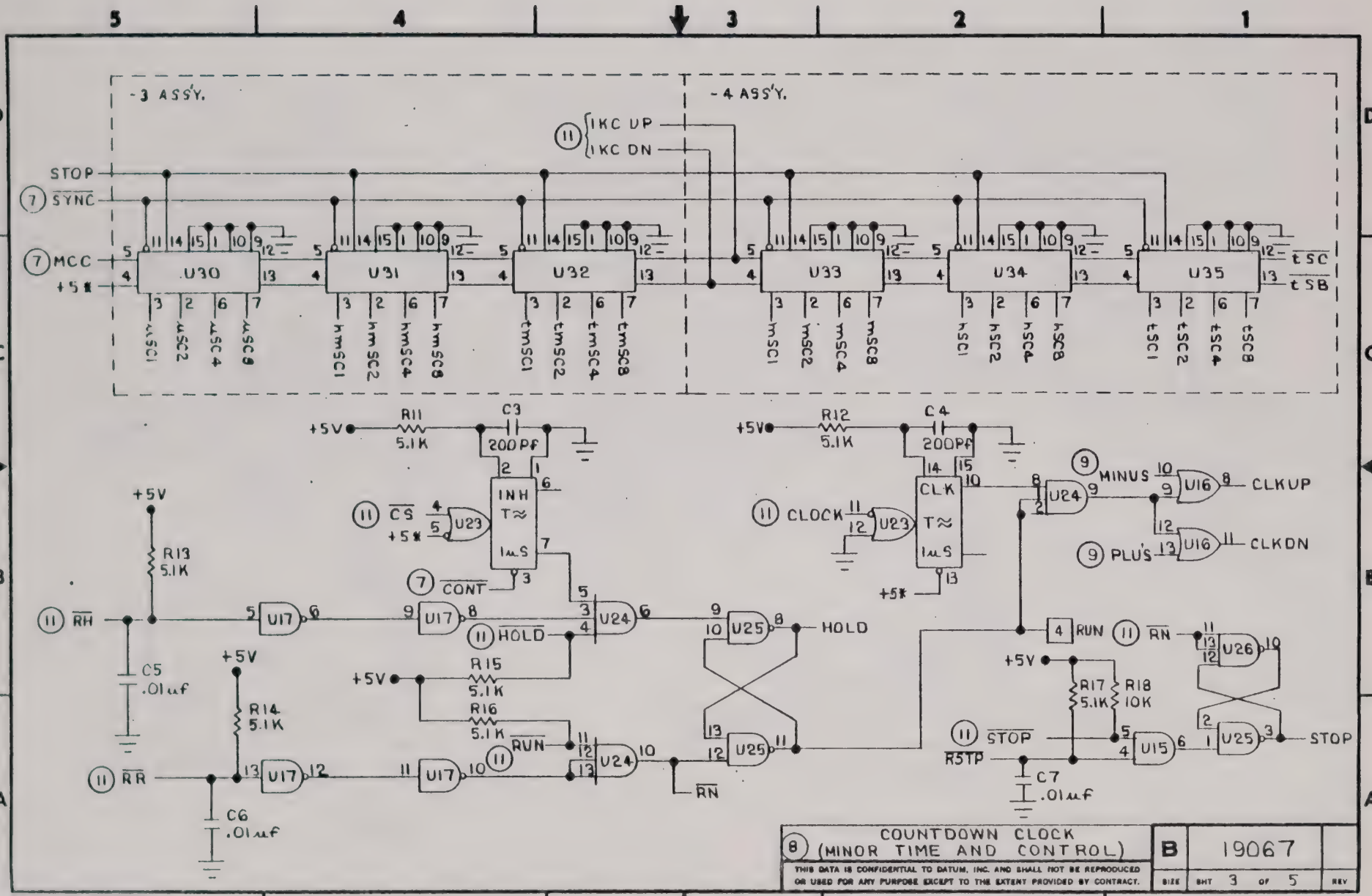
DWN	D. Hardy 3/21/84	DES	
CHK		ENGR	3/31/84
SCALE	NONE	FSC	31160

B | 19067 | REV

SHT 1 OF 5

NOTES: UNLESS OTHERWISE SPECIFIED


+5V
R1 47K
R2 5.6K
2N3649 Q1
C1 4.7uf 35V
U28
U27
ENTER
ZERO HOLD
CONTINUOUS
E11
E10
E9
CONT
R4 10K
R3 470Ω
PF-Ī
CLK IN
R5 10K
U26
CLK 2
CLK 1
-1 ASS'Y.
CO236 1MHZ
E1 MCC
-2 ASS'Y.
CO251 1MHZ
R8 N/U
SYNC EDGE SELECT
POS
NEG
R6 10K
R7 1K
C2 N/U
C20 N/U
SYNC*
E3
E4
E5
U21
SYNC
T≈
Q1uS
R9 5.1K
E2
TSPU
R10 10K
+5*
C19 .1uf
7
COUNTDOWN CLOCK
(TIME BASE / MISC. CKTS)
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.
B
19067
SHT 2 OF 5
REV



8 COUNTDOWN CLOCK (MINOR TIME AND CONTROL)

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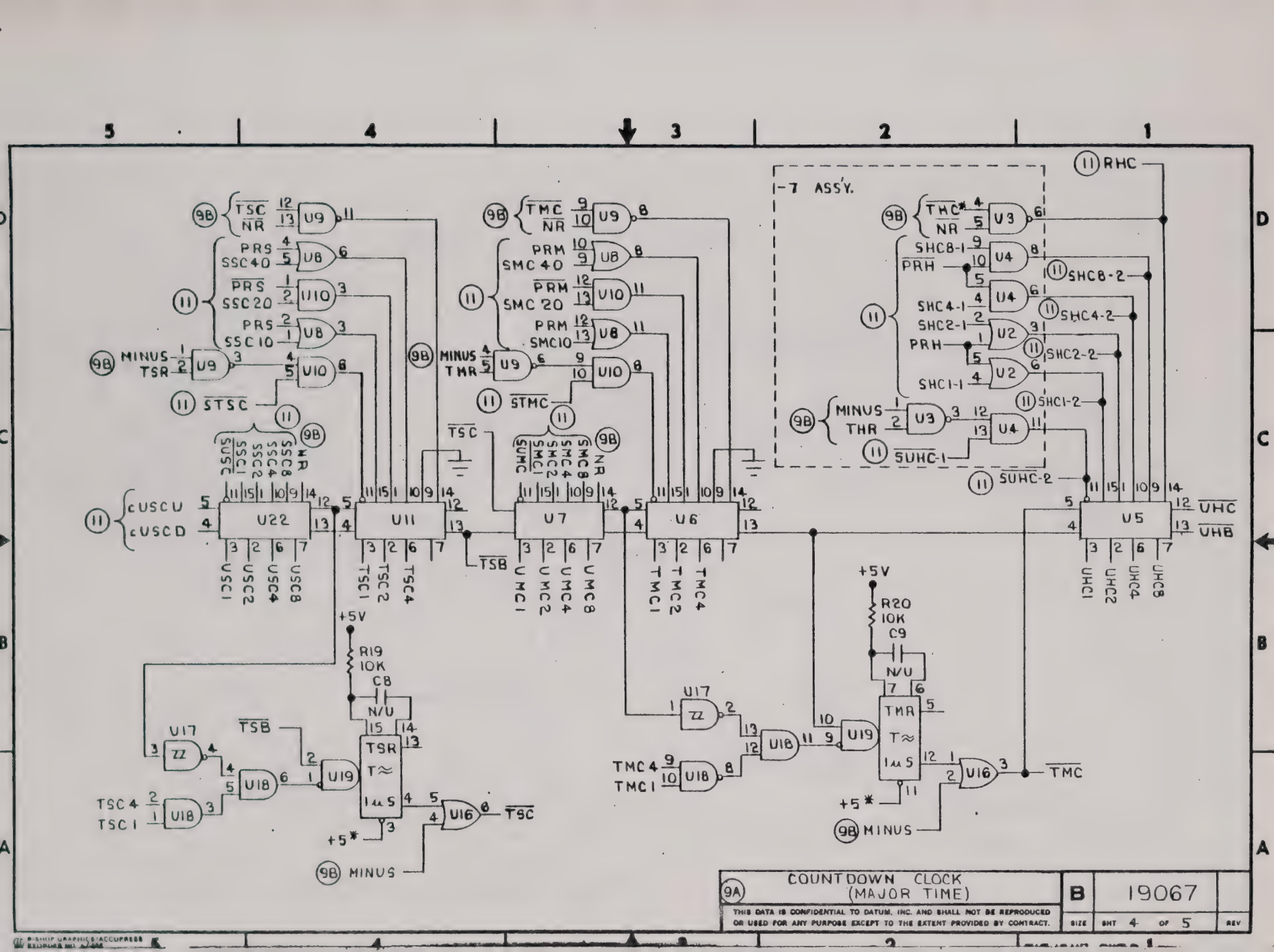
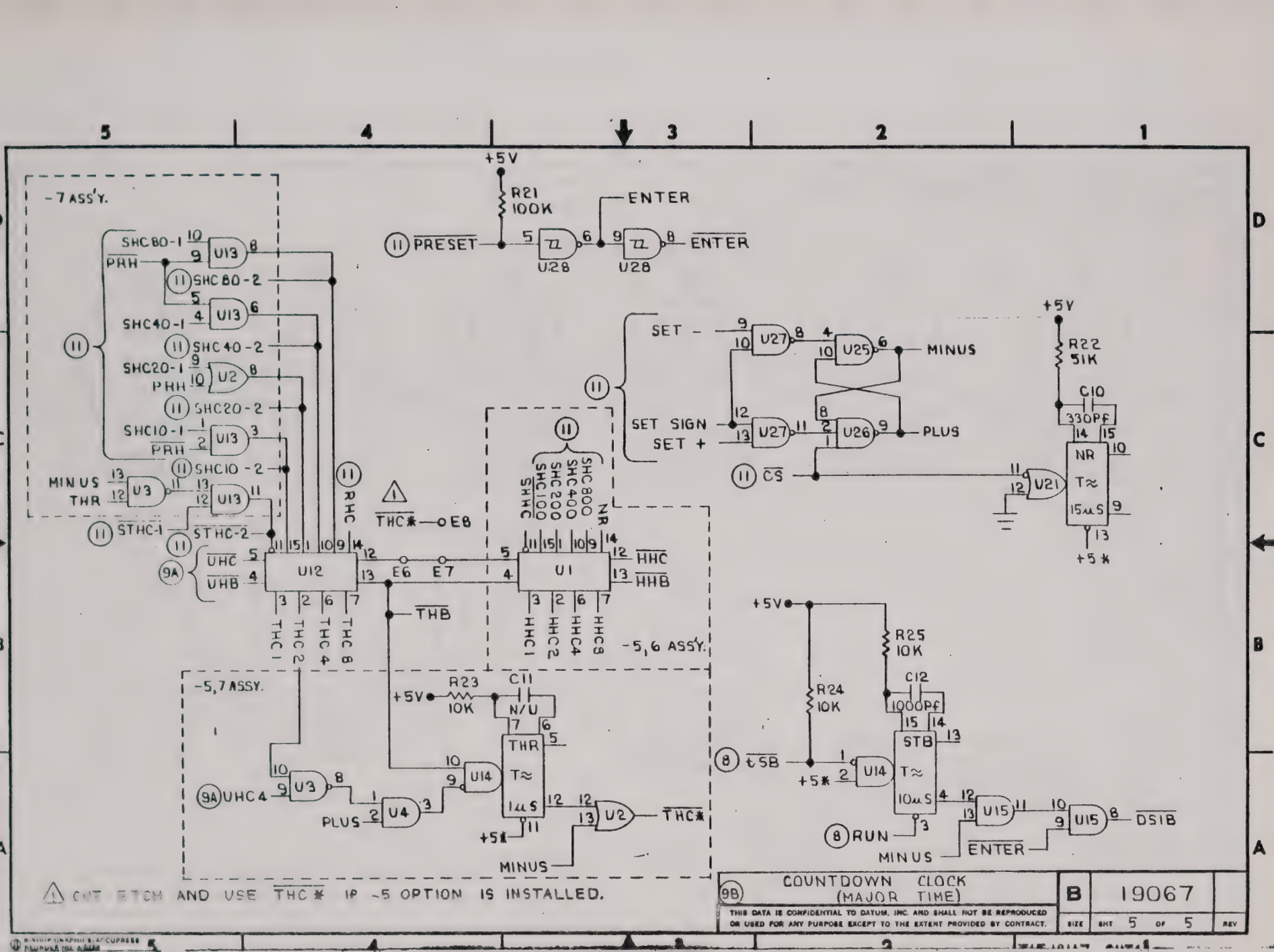
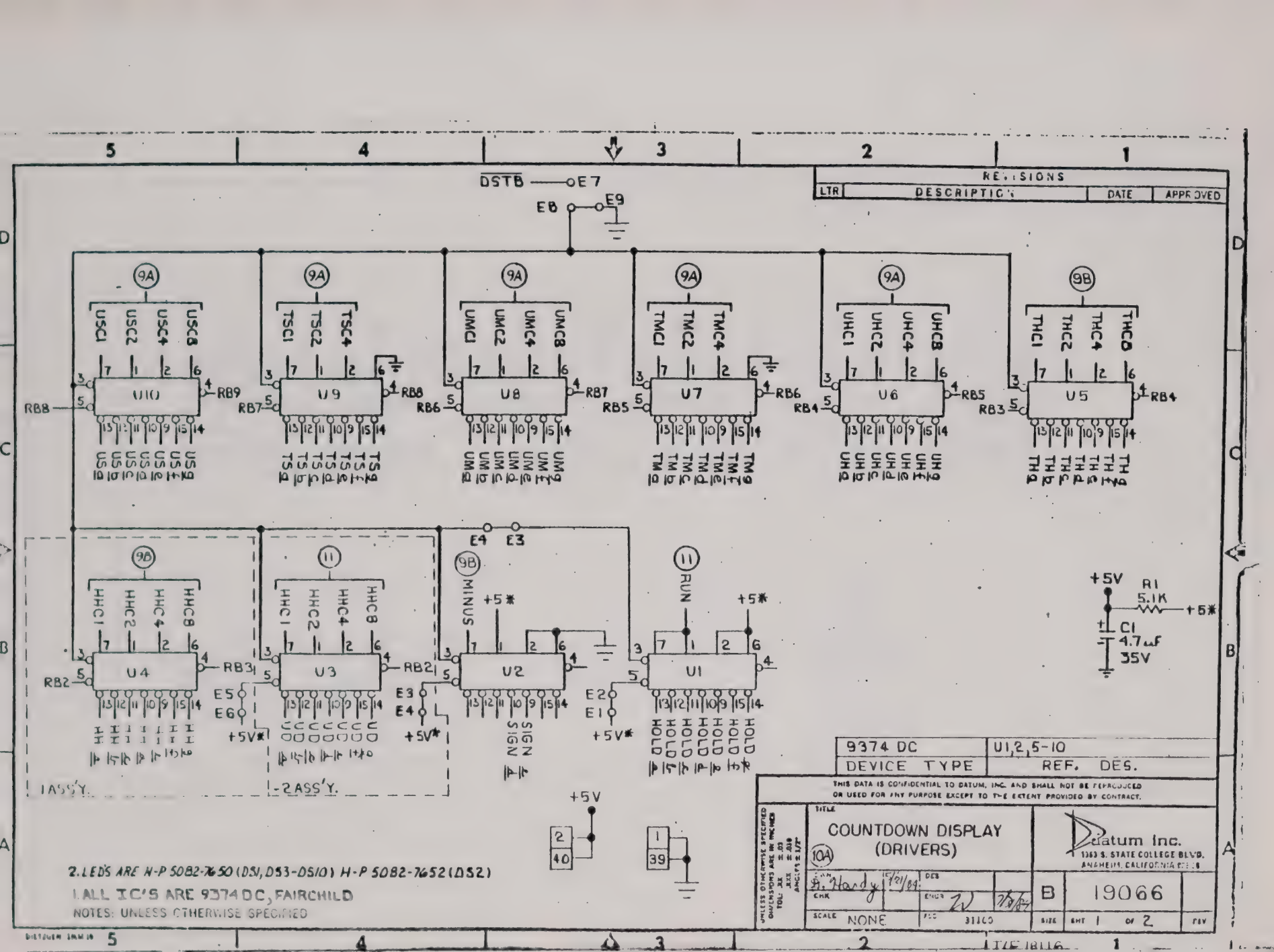
SIZE	DWG NO.	REV
B	19067	
SHT 3 OF 5		


5
4
3
2
1
D
C
B
A
I-7 ASS'Y.
(11) RHC
(9B) TSC NR 12 13 U9 11
PRS SSC40 4 5 U8 6
(11) PRS SSC20 1 2 U10 3
PRS SSC10 2 1 U8 3
(9B) MINUS TSR 1 2 U9 3
4 5 U10 6
(11) STSC
(11) (9B) SSC1 SSC2 SSC4 SSC8 NR
(11) cUSCU
cUSCD
5 4 U22 13
USC1 USC2 USC4 USC8
5 4 U11 13
TSC1 TSC2 TSC4
TSB
TSC
(9B) TMC NR 9 10 U9 8
PRM SMC40 10 9 U8 8
(11) PRM SMC20 12 13 U10 11
PRM SMC10 12 13 U8 11
(9B) MINUS TMR 4 5 U9 6
9 10 U10 8
(11) STMC
(11) (9B) SMC1 SMC2 SMC4 SMC8 NR
5 4 U7 13
UMC1 UMC2 UMC4 UMC8
5 4 U6 13
TMC1 TMC2 TMC4
(9B) THC* NR 4 5 U3 6
SHC8-1 PRH 9 10 U4 8
5
(11) SHC8-2
SHC4-1 4 U4 6
(11) SHC4-2
(11) SHC2-1 2 U2 3
PRH 1 5
(11) SHC2-2
SHC1-1 4 U2 6
(11) SHC1-2
(9B) MINUS THR 1 2 U3 3 12
13 U4 11
(11) SUHC-1
(11) SUHC-2
5 4 U5 12 13 UHC UHB
UHC1 UHC2 UHC4 UHC8
+5V
R19 10K
C8
N/U
15 14
TSR
T≈
1 m S
13
U17 ZZ
TSB
TSC4 TSC1 U18
U19
U16
TSC
+5*
(9B) MINUS
+5V
R20 10K
C9
N/U
7 6
TMR
T≈
1 m S
12 1
11
U17 ZZ
TMC4 TMC1 U18
U18
U19
U16
TMC
+5*
(9B) MINUS
(9A) COUNTDOWN CLOCK (MAJOR TIME)
B
19067
SIZE
SHT 4 OF 5
REV
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.


-7 ASS'Y.
+5V
R21
100K
ENTER
PRESET
U28
U28
ENTER
SHC80-1
PRH
SHC80-2
SHC40-1
SHC40-2
SHC20-1
PRH
SHC20-2
SHC10-1
PRH
SHC10-2
MINUS
THR
STHC-1
STHC-2
UHC
UHB
U13
U2
U3
RHC
THC*
E8
E6
E7
U12
U1
THB
THC1
THC2
THC4
THC8
SHC100
SHC200
SHC400
SHC800
NR
HHC
HHB
HHC1
HHC2
HHC4
HHC8
-5,6 ASS'Y.
SET -
SET SIGN
SET +
CS
U27
U25
U26
MINUS
PLUS
+5V
R22
51K
C10
330PF
NR
T≈
15mS
U21
+5*
-5,7 ASSY.
+5V
R23
10K
C11
N/U
THR
T≈
1mS
U14
UHC4
PLUS
U4
U3
+5*
MINUS
U2
THC*
+5V
R25
10K
R24
10K
C12
1000Pf
STB
T≈
10mS
U14
+5*
TSB
RUN
U15
U15
ENTER
MINUS
DSIB
1 CUT ETCH AND USE THC* IF -5 OPTION IS INSTALLED.
9B
COUNTDOWN CLOCK
(MAJOR TIME)
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.
B
19067
SIZE
SHT 5 OF 5
REV



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

9374 DC	U1,2,5-10
DEVICE TYPE	REF. DES.

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± .03 XX ± .010 XXX ± .005 ANGLES ± 1/2°

TITLE: COUNTDOWN DISPLAY (DRIVERS)

10A

DRAWN R. Hardy 12/21/84 DES

CHK

ENGR RV 1/3/85

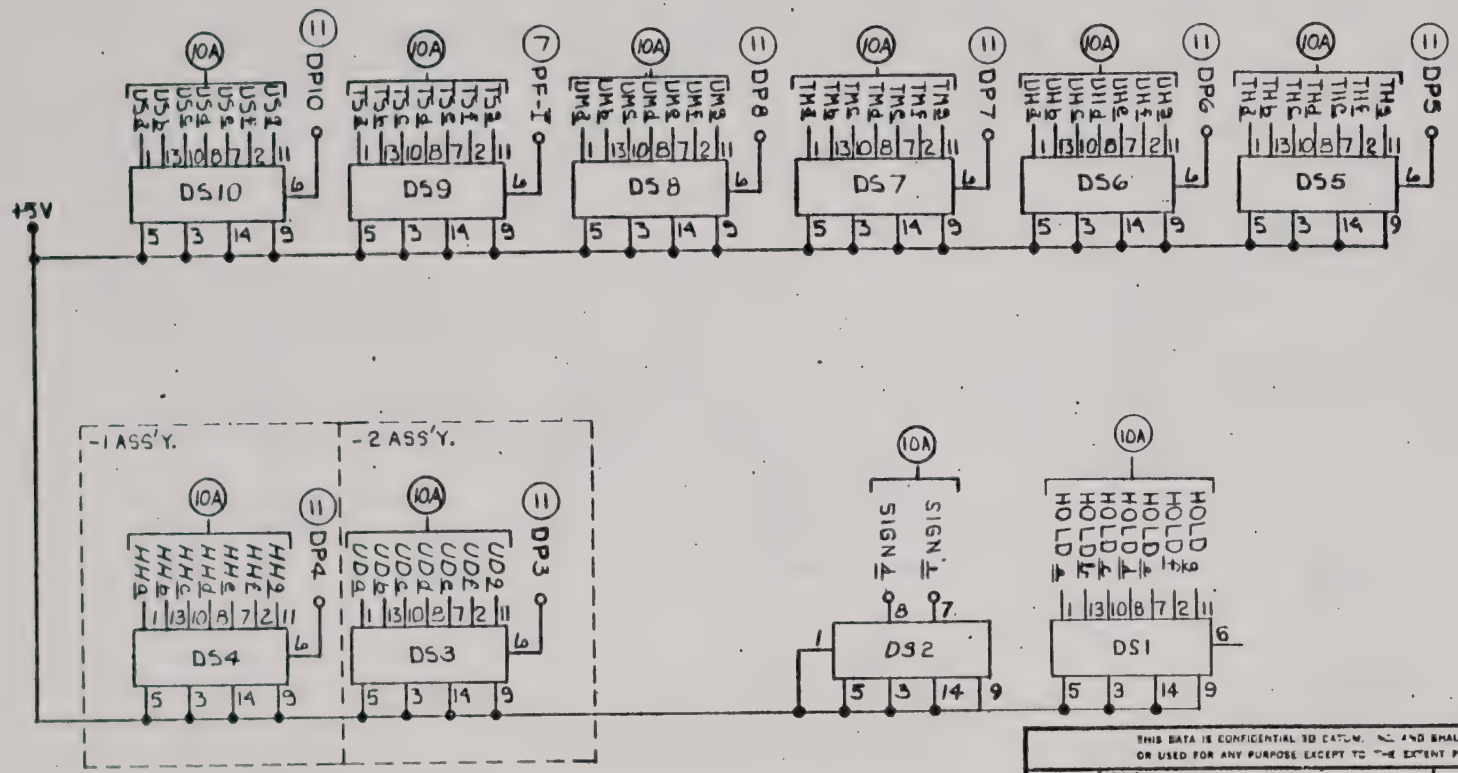
SCALE NONE FSC 31140

Datum Inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA

B | 19066

SIZE | SHT 1 OF 2 | REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: .XX ± .02 .XXX ± .010 ANGLES ± 1/2°

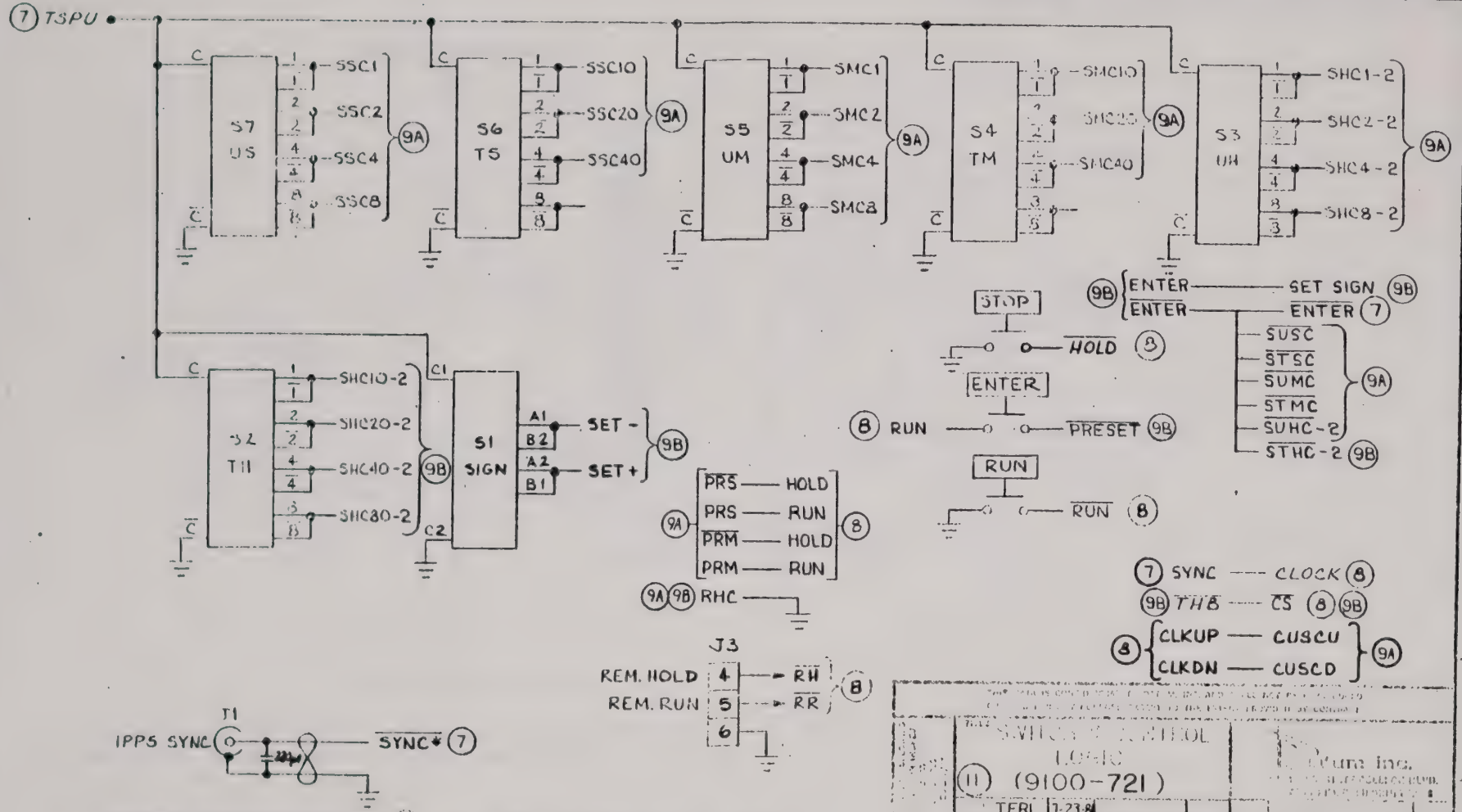
TITLE
COUNTDOWN DISPLAY
10B

Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

DWN	DATE	DES	
D. Hardy	5/21/84		
CHK		ENGR	

SCALE NONE | FSC 33163 | SIZE B | 19066 | SHT 2 OF 2 | REV

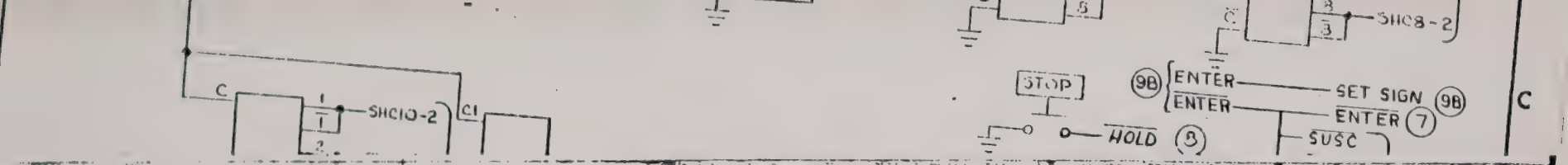
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	REVISED PER ECO T4868	5-21-84	DH



1. TERMS REFERENCED TO (11) AND NOT SHOWN ARE NOT USED

NOTES: UNLESS OTHERWISE SPECIFIED

SWITCH CONTROL LOGIC (11) (9100-721)			Datum Inc.	
TERI	1-23-84		9100-8445	A
NONE				



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	REVISED PER E.O. 4055	12/8/77	

TO BATTERY PACK (OPTION)

220 VAC

115 VAC

AC NEUT.
AC LINE

C1
.01 µF
1000V

C2
.01 µF
1000V

F1
1A, S/B

5

E2 E1

COM LOW
COM NORM
COM HIGH

T1
956043

60Hz

CR51
VH148

+8V

+5V1

+5V2

+5V3

-5V

-8V

C6
4700µF
16V

C5
4700µF
16V

C4
4700µF
16V

C3
500 µF
15V

A3 A2 A1

R1
200Ω

CR1
1N752A
5.6V

TO BATTERY SUPPLY (OPTION)

5 JUMPER SHOWN FOR COMPLETENESS, UNIT WIRING DIAGRAM WILL SHOW ANY ALTERNATE CONNECTIONS.

4. 16494-3 ASSY AS SHOWN
3. 16494-2 ASSY OMIT A3, C6
2. 16494-1 ASSY OMIT R1, CR1
1. 16494 ASSY OMIT A3, C6, R1, CR1

NOTES: UNLESS OTHERWISE SPECIFIED

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TITLE: POWER SUPPLY (49)

Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92803

B 16494 A

SCALE: NONE SIZE: B SHEET 1 OF 1

SECTION VII
MATERIALS LISTS

7.1 INTRODUCTION

The following terms are used on the materials lists form. Their specific usage is explained below to aid in using the included information for replacement part logicstics.

a. ITEM -- A numeric listing of each part or component comprising each assembly.
b. STOCK/PART Number -- Each part or component is identified by its DATUM stock number or original manufacturer's part number. A DATUM stock number is used when the part is maintained in DATUM's stock inventory. The manufacturer's part number is used when the part is not maintained in inventory.
c. DESCRIPTION -- Each part or component is identified by its descriptive nomenclature.
d. MFR/SPEC -- Each part or component availability source is listed. Those items identified with DATUM stock numbers show "DATUM". Those not in inventory (and listed by original manufacturer's part number) show the original manufacturer.
e. QTY -- The quantity of each item utilized in the assembly.
f. REF. DES. -- Identification of the part or component as indicated on support schematic drawing.
g. UNIT COST, LOT TOTAL -- For customer use, as desired.

7.2 MATERIALS LISTS

1.	Countdown Clock (Top Assembly)	9100-721
2.	Power Supply	16494
3.	Countdown Display	19066
4.	Countdown Clock (Logic)	19067

DATE: 4-18-84
DRAWN: Carey
CHK:

MATERIAL LIST

Datum inc.

JOB NO:
QUANTITY
B

TITLE: COUNTDOWN CLOCK

ASS'Y NO: 9100-721

SHT / OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	LOT TOTAL
1	SK9100-721	SHIPPING KIT	DATUM	1			
2							
3	0225-0221	CAPACITOR 220Pf	"	1			
4	1202-0102	SWITCH SPDT	"	1			
5	1204-3903	" P/B	"	3			
6	1212-7606-1	" T/W	"	6			
7	" -7611	" T/W	"	1			
8	1299-765G	SPACER	"	2			
9	" -765G-8	BAND HARDWARE	"	1			
10	1704-1002	CONNECTOR BNC	"	1			
11	" -1625-6R	" 6P	"	1			
12	1792-1561	CONTACT SOCKET	"	6			
13	1795-0001	WASHER	"	1			
14	" -0002	"	"	1			
15	2325-2005	FASTENER	"	2			
16							
17	700546	STIFFENER STK	"	2			
18	703138	COVER STK	"	2			
19	703140	CENTER SUPPORT STK	"	1			
20	703142-2	SIDE GUSSET STK	"	2			
21	703335-1	BUTCH PLATE STK	"	1			
22	703335-2	" " STK	"	1			
23	703336	CONN " STK	"	1			
24	703995-2	MTG BRKT	"	2	PAINT 26440		
25	704899	REAR PANEL STK	"	1			
26	705726-1	LENS	"	1			

NOTES:

DATE: 4-18-84

DRAWN: CARY

CHK:

MATERIAL LIST

datum inc.

JOB NO:

QUANTITY

REV B

TITLE: COUNTDOWN CLOCK

ASS'Y NO: 9100-721

SHT 2 OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	LOT TOTAL
27	708989-1	COVER PLATE	DATUM	1	PAINT 26440 S/S WHITE		
28	708990	FRONT PANEL	"	1			
29	931500	HANDLE STK	"	2			
30							
31	16494	POWER SUPPLY STK	"	1			
32	19066	DISPLAY & DRIVER	"	1			
33	19067	COUNTDOWN CLOCK	"	1			

NOTES:

DATE: 6-4-74

DRAWN: RGE

CHK:

MATERIAL LIST

datum inc.

JOB NO:

QUANTITY

A

TITLE: POWER SUPPLY

ASS'Y NO: 16494

SHT 1 OF 1

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	LOT TOTAL
1	0219-0478	CAPACITOR 4700uf@16V	DATUM	2	C4,5		
2	" -0507	" 500uf@15V	"	1	C3		
3	0226-0103	" .01uf@1000V	"	2	C1,2		
4							
5	0301-7805	I.C. 7805UC	"	2	A1,2		
6							
7	0540-0148	BRIDGE RECTIFIER VH148	"	1	CR51		
8							
9	0601-6043	TRANSFORMER 956043	"	1	T1		
10							
11	0702-0010	FUSE 1A 3AG S/B	"	1	F1		
12	0750-0200	FUSEPOST	"	1			
13							
14	1704-1061-1	RECEPT AC	"	1			
15	1708-3898	SKT 16P W/W	"	2			
16							
17	704762-2	P.S. BKT STK	"	2			
18	704967	HEATSINK STK	"	1			
19	704968	INSULATOR STK	"	1			
20							
21	170956 N/C	P.C. BD. STK	"	1			
22							
23	A-16494	ASSY AID	"	REF			

NOTES:

BISHOP GRAPHICS/ACCUPRESS
REORDER NO. A 7967

DATE: 4-10-84

DRAWN: IC

CHK:

MATERIAL LIST

datum inc.

JOB NO:

QUANTITY

TITLE: DISPLAY & DRIVER

ASS'Y NO: 19066

REV

SHT / OF /

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.				REF. DES.	UNIT COST	LOT TOTAL	
1	0102-0512	RESISTOR 5.1K 1/4W, 5%	DATUM	1				R1			
2											
3	0220-0415	CAPACITOR 4.7uf, 35V	"	1				C1			
4	0226-0104-2	" .1uf	"	1				C2			
5											
6											
7	0301-9374	IC 9374DC	"	8			*	U1, 2, 5, 6, 7, 8, 9, 10			
8											
9	2205-0002	NUM DISPLAY	"	1				DS2			
10	" -0006	" "		7				DS1, 5, 6, 7, 8, 9, 10			
11	1708-0036	HEADER	"	2							
12	1708-3788	SOCKET SOLDER 14P	"	8							
13	" -3898	W/W 16P	"	8			*				
14											
15	1702-0040-6	HEADER	"	1							
16	2310-1591-8	MTG BLOCK	"	2							
17											
18	171899N/C	PC BOARD (DISPLAY	"	1							
19	171900N/C	PC BOARD (DRIVER	"	1							

NOTES:

DATE: 4-9-84

DRAWN: IC

CHK:

MATERIAL LIST

datum inc.

JOB NO:

QUANTITY

REV

TITLE: COUNTDOWN CLOCK

ASS'Y NO: 19067

SHT / OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.				REF. DES.	UNIT COST	LOT TOTAL	
1	0102-0471	RESISTOR 470Ω ¼W, 5%	DATUM	1				R3			
2	" -0512	" 5.1K "	"	8				R9, 11-17			
3	" -0562	" 5.6K "	"	1				R2			
4	" -0103	" 10K "	"	8				R4, 5, 6, 10, 18, 19, 20, 24			
5	" -0473	" 47K "	"	1				R1			
6	" -0513	" 51K "	"	1				R22			
7	" -0104	" 100K "	"	1				R21			
8	" -0102	" 1K "	"	1				R7			
9	0225-0331	CAPACITOR 330pf	"	1				C10			
10	0220-0475	" " 4.7μf, 35V	"	4				C1, 13, 14, 15			
11											
12	0226-0201	" 200pf	"	2				C3, 4			
13	" -0103-1	" .01μf	"	3				C5, 6, 7			
14	" -0104	" .1μf	"	4				C16, 17, 18, 19			
15	" -0102-1	" 1000pf	"	1				C12			
16											
17											
18	0301-74C0	IC UA74C00N	"	3				U9, 25, 27			
19	" -74C0-8	" MM74C08N	"	3				U10, 15, 18			
20	" -74C2-21	" MM74C221N	"	2			*	U14, 19			
21	" -HC14	" MM74HC14N	"	2				U17, 28			
22	" -HC32	" MM74HC32N	"	2				U8, 16			
23	" -HC19-2	" MM74HC192N	"	6			*	U5, 6, 7, 11, 12, 22			
24	" -1402-3	" MC14023BCP	"	1				U26			
25	" -1407-3	" MC14073BCP	"	1				U24			
26	" -HC45-38	" MC74HC4538	"	2			*	U21, 23			

NOTES:

DATE: 4-9-84

DRAWN: IC

CHK:

MATERIAL LIST

datum inc.

JOB NO:

QUANTITY

REV

TITLE: COUNTDOWN CLOCK

ASS'Y NO: 19067

SHT 2 OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.				REF. DES.	UNIT COST	LOT TOTAL	
27	0550-7700	TRANSISTOR 2N3643	DATUM	1				Q1			
28											
29											
30	1708-3897	IC SOCKET W/ 14P	"	12							
31	" -3898	" " W/ 16P	"	10			*				
32											
33	1702-0040-4	PC CONNECTOR 40P	"	1							
34	1704-0040-1	SOCKET CONN	"	1							
35	4004-0040	CABLE	"	2 1/2"							
36											
37											
38	171901 N/C	PC BOARD	"	1							

NOTES:

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